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F04F 10/00, F16K 15/02

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F1R R11
F2V VV3
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FR 2257802 A US 4414997 A

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(54) Siphon tube

(57) A syphon comprising a tube 16 having at its inlet end a valve 10 comprising an elongate enclosure 11 communicating at its outlet end with the tube and open to the exterior at its inlet end through an inlet passage 17 closable by a spool member 12 reciprocable longitudinally within the enclosure 11, the enclosure 11 being such as to guide the spool member 12 during one stroke of its reciprocation to a position at which it temporarily closes the inlet passage 17 to prevent the flow of liquid out of the valve, and such that at all other positions of the spool member 12 the enclosure allows the flow of liquid from the inlet passage 17 around the spool member and through the outlet end of the valve 10 into the tube 16. The syphon tube is intended to handle toxic or corrosive liquids, and is made of plastics material, the spool 12 being of glass and urged towards the inlet passage 17 by a compression spring 25. A filter 14 is provided at the entry to the tube.

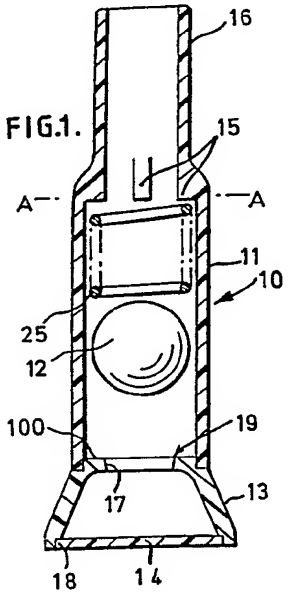

FIG.1.

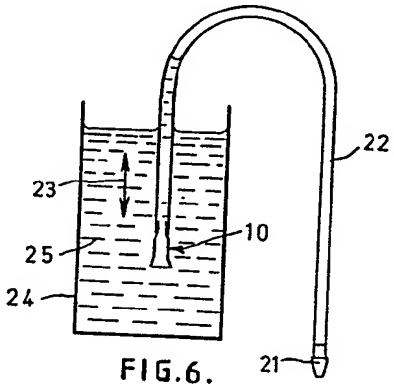

FIG.6.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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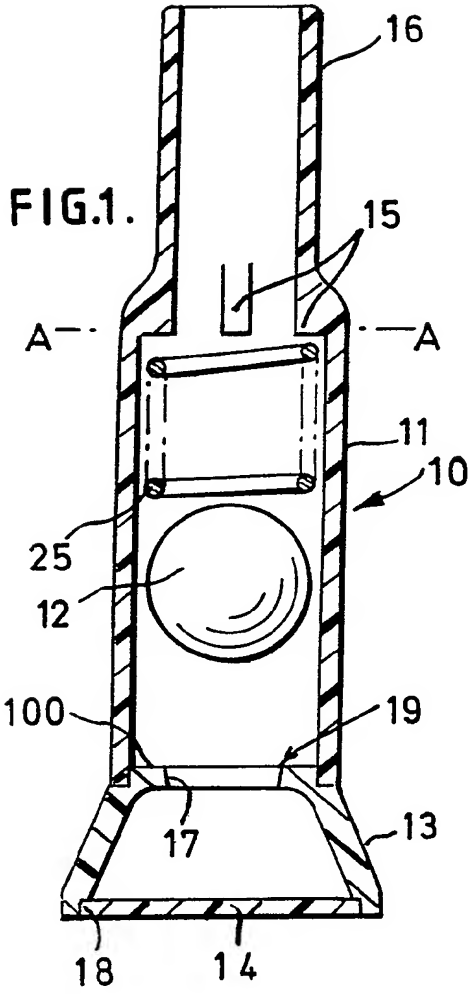

FIG.1.

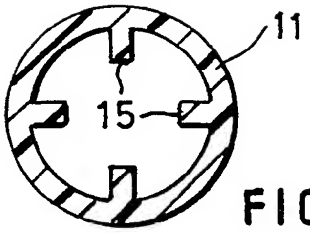

FIG.2.

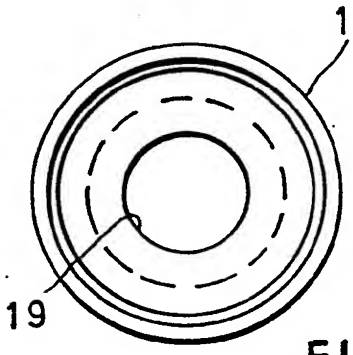

FIG.3.

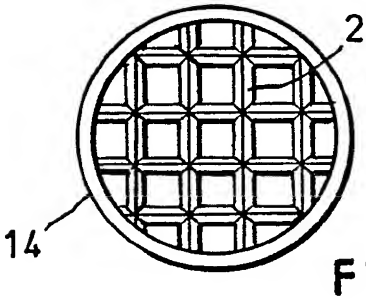

FIG.4a.

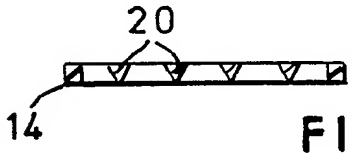

FIG.4b.

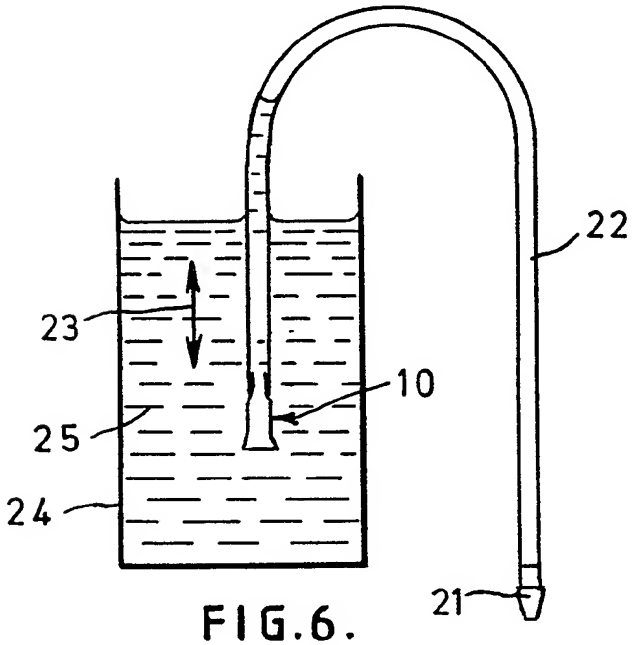

FIG.6.

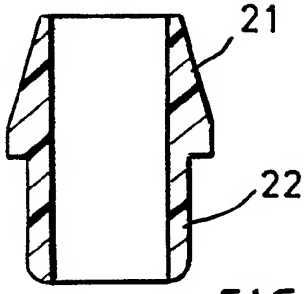

FIG.5.

Syphon Tube

This invention relates to a syphon tube which is capable of manual operation and is particularly useful in the syphoning of toxic or corrosive liquids.

The principle of a syphon tube, whereby a flow of liquid through the tube is maintained provided the outlet limb of the tube is at a lower level, has been known for a long time. To initiate a flow of liquid through the syphon, it is necessary first to fill the tube with the liquid to an extent sufficient that the differential weights of liquid in each limb of the tube will initiate the flow. The simplest way of filling the tube is to apply suction to the outlet end, often by applying one's mouth and using lung pressure. Clearly this is dangerous in the case of toxic or corrosive materials, and whether or not the mouth is used it is inconvenient to have to manipulate the syphon first of all to apply suction and then to lower the tube to the appropriate syphoning position.

Syphon tubes are also available in which the tube is initially filled with the liquid by means of a hand-operated pump disposed in-line at some point along the length of the tube. Such an arrangement requires two valves, for example reed valves, and requires that the liquid should pass through the pump chamber. The valves are liable to wear, and the arrangement is in any event complex and costly to produce. Moreover, it is difficult to provide such a pump which is capable of use with some corrosive liquids. Further, where the liquid to be syphoned contains particulate solid material, for example, the pump valves are

likely to be obstructed and rendered ineffective.

Accordingly, the purpose of the invention is to provide a syphon which is simple to use and relatively inexpensive to produce, and moreover is capable of use, if made of appropriate materials, with materials which are hazardous by virtue of being corrosive or toxic.

The invention provides a syphon comprising a tube having at its inlet end a valve comprising an elongate enclosure communicating at its outlet end with the tube and open to the exterior at its inlet end through an inlet passage closable by a spool member reciprocable longitudinally within the enclosure, the enclosure being such as to guide the spool member during one stroke of its reciprocation to a position at which it temporarily closes the inlet passage to prevent the flow of liquid out of the valve, and such that at all other positions of the spool member the enclosure allows the flow of liquid from the inlet passage around the spool member and through the outlet end of the valve into the tube. The tube is conveniently flexible, and may be made for example of a thermoplastics material such as PVC. It is preferably transparent or partially transparent so that the level of liquid within the syphon is visible.

In use, the valve is caused to act as a reciprocating pump, by effecting reciprocating movements of the inlet portion of the tube, lengthwise of the valve. During the downward stroke of each reciprocation, liquid enters the enclosure and passes into the tube; during each upward stroke, the liquid in the tube is held there by the

closure of the valve as a result of the spool member closing the inlet passage thereof.

The elongate enclosure preferably comprises at least one stop member at or adjacent its outlet end, to prevent the spool member from obstructing liquid flow into the tube.

In order to enhance the flow of liquid into the valve during each downward stroke in use, the inlet end of the valve preferably has a skirt opening outwardly away from the elongate enclosure, so that the effective inlet area of the valve is greater than it would be without the skirt. This has the effect of improving the rate of flow of liquid into the syphon during the initial pumping operation while the syphon is being primed, and may have the effect of reducing the number of reciprocating strokes required to prime the syphon.

The spool member is conveniently a spherical bearing, for example a glass ball, whose diameter is less than the inner diameter of the elongate enclosure to allow for the flow of liquid around the bearing. However, cylindrical or ovoid shapes may be used for the spool member instead. In the case of a spool member such as a ball with rotational symmetry about the elongate axis of the valve the elongate enclosure is preferably cylindrical and the inlet passage is preferably a short cylindrical passage formed in an end wall of the elongate enclosure and coaxial therewith. The inner edge of the inlet passage then acts as a valve seat for the spool member, and to improve the seal between the spool member and the inlet passage the edge is preferably chamfered to the appropriate configuration.

In order to improve the efficiency of the pump, the spool member may be biased resiliently towards the position at which it closes the inlet passage, conveniently by means of a compression spring within the elongate enclosure. The spring may be a steel coil spring in contact with the spool member, where the latter is a glass ball or marble, for example.

Where the liquid to be syphoned may contain solid particles, for example where an aquarium is to be emptied, it is preferable to provide a filter at the valve inlet. Where a skirt is provided as described above, the filter preferably forms an inlet at its base.

In order that the invention may be better understood, one example will now be described, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is an axial section through a valve of a syphon embodying the invention;

Figure 2 is a cross-section taken on the line A-A of Figure 1;

Figure 3 is an underneath plan view of the valve of Figure 1;

Figure 4a is an underneath plan view corresponding to Figure 3 but of a filter disc for attachment to the valve of Figure 1;

Figure 4b is a longitudinal section through the filter disc of Figure 4a;

Figure 5 is a longitudinal section through a nozzle; and

Figure 6 is a diagram of a liquid container being emptied by means of a syphon comprising the valve of Figure 1, the nozzle of Figure 5 and a flexible tube.

As shown in Figure 1, a syphon tube valve 10 comprises an elongate cylindrical enclosure 11 having at its upper end a cylindrical continuation 16 of smaller radius for insertion into the end of a flexible plastics tube 22 (Figure 6). The valve is formed as a single plastics moulding. At the upper end of the enclosure 11 is an arrangement of four shoulders 15 equi-angularly disposed around the axis as shown most clearly in Figure 2. The lower end of the enclosure 11 is closed by means of a circular end wall 100 in which is formed at its centre a circular opening 19 constituting an inlet passage. The end wall 100 is part of an end skirt 13 whose side walls are frusto-conical.

As shown more clearly in Figures 3, 4a and 4b, the lower end of the skirt 13 is removably fitted with a filter disc 14 with an inlet matrix 20 appropriate to the size of particle which it is desired to stop.

A spool member in the form of a glass ball 12 is reciprocable longitudinally within the elongate enclosure 11, with a wide clearance at the sides to allow the free flow of liquid past the ball 12. It is resiliently biased downwards towards the closed position, by a stainless steel coil compression spring 25 inserted in the enclosure 11 and abutting the shoulders 15 and the glass ball 12. Although not shown in this example, the upper inner edge 19 of the inlet passage 17 is chamfered to form a surface

complementary to the spherical surface of the spool member 12, to act as a valve seat. In an alternative example, the spring 25 is omitted for simplicity; the inner separation 20 of the shoulders 15 is such as to form an end stop for the upward reciprocating stroke of the ball 12 within the elongate enclosure 11, and the configuration is such in relation to the diameter of the ball 12 that the ball 12 is prevented from obstructing the flow of liquid from the enclosure 11 through the extension 16 and thus into the tube 22.

In these examples, the diameter of the ball is 15 mm, the inner diameter of the enclosure 11 is 18.2 mm and the separation 20, which is also equal to the inner diameter of the extension 16, is 11 mm. The length of the extension, down to the edge of the shoulders 15, is 31.8 mm, and the length of the elongate enclosure 11 is 44.5 mm.

A nozzle 21, shown in Figure 5, is provided for the outlet end of the syphon, and has a tubular extension 22 for insertion into the end of the flexible plastics tube 22 (Figure 6).

The operation of the syphon will now be described with reference to Figure 6. The syphon consisting of the flexible plastics tube 22, the valve 10 inserted at one end, and the nozzle 21 inserted at the other, is arranged such that the inlet portion including the valve 10 is plunged into the liquid 25 to be syphoned, which may for example be contained in a vessel 24. With the outlet portion, including the nozzle 21, at a lower level, the inlet portion is moved rapidly up and down longitudinally, as shown by the arrow 23, so that upward accelerations encourage relative

downward accelerating strokes of the ball 12 within the elongate enclosure 11, assisted by the spring 25 when it is provided, and downward accelerations of the inlet portion of the syphon encourage upward accelerations of the ball 12. With each downward reciprocation of the syphon tube, the ball 12 is released from the valve seat 17 and liquid is collected by the skirt 13 and forced through the inlet passage 17 as a jet into the elongate enclosure 11 and through the extension 16 into the tube 22, causing the liquid level 24 to rise. During the upward reciprocation, the ball 12 reciprocates downwardly relative to the enclosure 11 and is guided by its cylindrical inner wall into the valve seat constituted by the inlet passage 17, thus closing the valve. Although some of the liquid will initially escape from the valve, the major part of the liquid will be retained, following closure of the valve. In this particular example in which the PVC tube is a 2 metre long pipe with a 15 mm internal diameter, three or four reciprocating cycles are required to prime the tube, and thereafter the tube syphons continuously, and is capable of decanting 5 litres of water in 30-35 seconds. Clearly the speed of flow will depend on the viscosity of the liquid.

Although not shown in the drawings, the flow through the syphon, once initiated, may be stopped by means of a further valve provided in-line in the tube at an appropriate point.

The material with which the valve is made is selected in accordance with the liquid to be syphoned. We have found that the thermoplastics material known as Delrin

(Trade Mark) from Du Pont is ideal as it is tolerant of highly corrosive and toxic liquids.

In this example, the skirt 13 and the remainder of the valve are moulded separately and are plastics-welded together, and similarly the filter is a separate moulding which is plastics-welded on to the skirt 13. However, some or all of these parts may be moulded integrally. They may alternatively be formed of metal or other material. As a further alternative, the valve enclosure may take a different configuration, not necessarily cylindrical, and the spool member may then take an appropriate shape which need not be a sphere, but it is considered essential that the spool member should be capable of reciprocating movements which, in use, are caused by corresponding reciprocating movements of the inlet end of the syphon tube.

CLAIMS

1. A syphon comprising a tube having at its inlet end a valve comprising an elongate enclosure communicating at its outlet end with the tube and open to the exterior at its inlet end through an inlet passage closable by a spool member reciprocable longitudinally within the enclosure, the enclosure being such as to guide the spool member during one stroke of its reciprocation to a position at which it temporarily closes the inlet passage to prevent the flow of liquid out of the valve, and such that at all other positions of the spool member the enclosure allows the flow of liquid from the inlet passage around the spool member and through the outlet end of the valve into the tube.

2. A syphon according to Claim 1, in which the tube is flexible.

3. A syphon according to Claim 1 or 2, in which the tube is of a thermoplastics material.

4. A syphon according to Claim 1, 2 or 3, in which the tube is at least partially transparent.

5. A syphon according to any preceding claim, in which the elongate enclosure comprises at least one stop member at or adjacent its outlet end, to prevent the spool member from obstructing liquid flow into the tube.

6. A syphon according to any preceding claim, in which the inlet end of the valve has a skirt opening outwardly away from the elongate enclosure, so that the effective inlet area of the valve is greater than it would be without the skirt.

7. A syphon according to any preceding claim, in which

the spool member is a spherical bearing whose diameter is less than the inner diameter of the elongate enclosure to allow for the flow of liquid around the bearing.

8. A syphon according to any preceding claim, in which the spool member has rotational symmetry about the axis of the valve and the elongate enclosure is cylindrical.

9. A syphon according to Claim 8, in which the inlet passage is a short cylindrical passage formed in an end wall of the elongate enclosure and coaxial therewith.

10. A syphon according to Claim 9, in which the inner edge of the inlet passage is chamfered so as to improve the seal with the spool member.

11. A syphon according to any preceding claim, in which the spool member is biased resiliently towards the position at which it closes the inlet passage.

12. A syphon according to Claim 11, in which the biasing means is a compression spring within the elongate enclosure.

13. A syphon according to any preceding claim, comprising a filter for solid particles, provided at the valve inlet.

14. A method of syphoning a liquid using the syphon tube of any preceding claim, comprising immersing its inlet end in the liquid and effecting reciprocating movements of the inlet portion of the tube, lengthwise of the valve, thereby causing the valve to act as a reciprocating pump.

15. A syphon tube substantially as described herein with reference to the accompanying drawings.

16. A method of syphoning a liquid, substantially as described herein with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
9123704.0

Relevant Technical fields

(i) UK Cl (Edition K) F1R - R11

(ii) Int Cl (Edition 5) F04F - 10/00, 10/02

Search Examiner
B F BAXTER

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE:WPI

Date of Search
20 DECEMBER 1991

Documents considered relevant following a search in respect of claims

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	US 4414997 A JACOBSON et al - whole document	1-5,8, 14
X	FR 2257802 A1 DOUGNAC et al * - whole document	1,2,5,8-10,14

* Indicates a later Citation.

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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